

**Divergent Thinking and Personality in Young Adolescents:
A Critical Analysis**

by

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I certify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and that to the best of my knowledge and belief, the thesis contains no copy or paraphrase of material previously published or written by another person, except where due reference is made in the text of the thesis.

John Hodgson

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ABSTRACT

This thesis explored the relationship between two divergent thinking variables, originality and fluency, and three personality variables, extraversion, neuroticism, and tendency to dissimulate (a Lie Scale). Divergent thinking was measured by adaptations of the Uses Test (c.f. Wilson, Guilford and Christensen, 1953), and the three personality variables were measured by the New Junior Maudsley Inventory (Furneaux and Gibson, 1966). Testing was conducted on three groups of adolescent children, one sample of 44 boys, one of 43 girls, and one of 68 girls.

There were no significant relationships between the divergent thinking variables and extraversion or neuroticism when each of the three samples were examined under untimed conditions of divergent thinking testing. Tendency to dissimulate was significantly and positively related to divergent thinking in the sample of 43 girls. However, when 34 girls from this group were re-tested fourteen months after initial testing, the tendency to dissimulate-divergent thinking relationship was not present, and the measures of both tendency to dissimulate and extraversion showed relatively low test-retest reliability coefficients.

It was considered possible that failure to demonstrate divergent thinking-extraversion relationships may have been due to the testing of divergent thinking under untimed

conditions, since extraverts show less persistence and greater speed of performance than introverts (Eysenck, 1967). To explore this possibility the group of 68 girls was tested for divergent thinking under timed as well as untimed conditions. In this study no significant divergent thinking-personality relationships were established.

In a critical consideration of the results it was suggested that other research approaches could be more productive in the study of divergent thinking. In particular, divergent thinking might be seen as a skill, as a situation specific behaviour, or as related to the adoption of a role. Experimental study of individual cases was suggested as a possible method for investigating the phenomenon of divergent thinking.

CHAPTER I

INTRODUCTION

CHAPTER I

INTRODUCTION

Divergent thinking has been related to many psychological variables, and has been studied for a long time under various names including fluency, originality, divergent thinking and creativity. Divergent thinking is obviously relevant to adaptive psychological functioning and to interpersonal and social interactions. As yet most research has been directed at the psychological level. This work has been aimed at finding relationships among personality and intellectual variables and methods of encouraging divergent thinking.

Much of the current interest in divergent thinking followed the Guilford (1950) Presidential Address on creativity to the American Psychological Association. Guilford was concerned to promote the study of the abilities and character traits possessed by the creative individual. He assumed that the ability to think divergently was an important characteristic of the creative person. By taking this line Guilford's address served as a turning point in the study of divergent thinking, diverting attention away from an alternative proposition that divergent thinking is related to extraversion (Di Scipio, 1971).

However a number of studies have indicated that both extraversion and the extraversive component traits of impulsivity, sociability, and lack of inhibitions are characteristic of the person who gains higher than average scores on divergent thinking tests (Hudson, 1968).

This thesis examines the hypothesis that divergent thinking and the personality dimension extraversion are positively related and seeks clarification of this relationship in samples of adolescent children. The relationships between divergent thinking and the dimension neuroticism and tendency to dissimulate (a Lie Scale) ⁽¹⁾ are also studied. This was possible because extraversion was measured by the New Junior Maudsley Inventory (NJMI) (Furneaux and Gibson, 1966) which has also neuroticism and Lie scales.

In Chapter II the term divergent thinking will be discussed, and relevant background research conducted prior to 1950 will be considered. Chapter III discusses more recent research into the relationships between divergent thinking and extraversion. Later chapters describe the studies conducted, and discuss the implications of the results.

(1) The Lie Scale is designed to measure the general trustworthiness of a person's self report (Furneaux and Gibson, 1966, p.10).

CHAPTER II

BACKGROUND TO THE STUDY

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Divergent Thinking: Definition

The term "divergent thinking" applies to the process of producing a variety of responses to a given stimulus where there are no right or wrong answers. The testee is expected to produce fluent, tangential and original responses. Divergent thinking is assessed by open-ended tests; a question in such a test might be: "How many uses can you think of for a brick?"

There is some confusion over the distinction between the terms "divergent thinking" and "creativity". This results from the assumption that creative production in many fields, for example scientific or artistic achievement, implies a high degree of ability for divergent thinking (Butcher, 1968). Further, open-ended tests have often been labelled creativity tests (Hudson, 1966). Thus there is a tendency in the literature on divergent thinking and creativity to use the terms synonymously. In this thesis only one term, "divergent thinking", is used to describe the

process of producing responses to an open-ended test. It is hoped that this avoids some of the semantic confusion which surrounds study in this area.

There have been differences between various research approaches in both the number and generality of component variables of divergent thinking studied. Most workers have assumed that there are at least three variables involved in divergent thinking: (1) originality, the statistical unusualness of a response, (2) fluency, the number of responses emitted, and (3) flexibility, the number of different categories of response (Mann, 1963). Scores on variables such as originality, fluency, and flexibility, have been combined frequently into the one divergent thinking score as in omnibus intelligence tests (Wallach and Kogan, 1965).

Guilford (1959, 1967) adopted a multi-factor approach, working from his structure of the intellect model of classification of human abilities. Using factor analytic techniques, he reports the isolating of sixteen divergent thinking factors (Guilford, 1968). In comparison with Guilford's research many other studies have been less concerned with the subdivisions of divergent thinking, and more interested in the relationships between divergent thinking as a unitary phenomenon and other personality and social variables.

A third general approach has involved attempts to

relate one or two of the component divergent thinking variables to personality characteristics (Anderson and Cropley, 1966; Di Scipio, 1971; Levy, 1968). This is the approach adopted in the present thesis.

Divergent Thinking and Personality: Research conducted prior to 1950

Early research on divergent thinking can be traced back to Galton who discussed fluency in some detail:

Extreme fluency and a vivid imagination are gifts naturally and healthily possessed by those who rise to be great orators or literary men, for they could not have become successful in those careers without it. The curious fact already alluded to of five editors of newspapers being known to me as having phantas-magoria, points to a connection between two forms of fluency, the literary and the visual.

Fluency may also be a morbid faculty, being markedly increased by alcohol (as poets are never tired of telling us) and by various drugs; and it exists in delirium, insanity, and states of high emotion. The fluency of a vulgar scold is extraordinary. (1883, pp. 205-206)

Subsequently many early researchers studied the relationship between divergent thinking and intelligence. Two divergent thinking variables examined were (1) originality, an estimate of the frequency of rare verbal responses, and (2) fluency, a quantitative estimate of the rate of verbal output.

Early researchers conceptualised the study of originality as the investigation of imagination, and

Original responses to given stimuli were examined. The stimuli were a variety of materials such as ink blots, words and abstract paintings. In particular, Cattell (1934) and Chassell (1916) developed tests similar to the current divergent thinking tests.

In his book, "The Abilities of Man", Spearman (1927) presented the view that tests of originality define a specific cognitive factor. He suggested that originality tests could be employed in a test battery to yield a more comprehensive estimate of the general intelligence factor(g). Spearman's point of view was also held by Andrews (1930), Chassell (1916), Hargreaves (1927) and Simpson (1922). However, the correlations between measures of originality and other tests of intelligence were invariably low, suggesting that originality was not strongly related to intelligence. It appeared that originality was also related to the absence of inhibitions, and possibly to a lack of self-criticism (Hargreaves, 1927).

In the study of the fluency component of divergent thinking early research established that fluency was also related to personality characteristics, particularly to surgency (Cattell, 1933; Garnett, 1919; Stephenson and Studman, 1934). Spearman and Wynne-Jones (1950) suggested that the factor fluency might be more appropriately studied in the field of character than in the field of abilities (p. 141). Further, Vernon (1950) suggested that the

Fluency factor might be related to the popular conception of extraversion rather than to an ability. Previous evidence for Vernon's notion was provided by Gewirtz (1948), who showed that fluency correlated positively with behaviour ratings of the traits cheerfulness, gregariousness, competitiveness, curiosity and originality, and negatively with social apprehension, patience and conformity.

In general the research up until 1950 supported the notion that originality might be related to an absence of inhibitions and a lack of self criticism, and that fluency is correlated with surgency and extravertive traits.

The relationship between divergent thinking and extraversion is more extensively considered in Chapter III.

CHAPTER III

DIVERGENT THINKING AND EXTRAVERSION

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Divergent Thinking and Traits Related to Extraversion

Research conducted since 1950 has supported earlier findings that divergent thinking variables are related to personality characteristics. In particular many studies have indicated that divergent thinking is related to components of the personality dimension extraversion.

The typical extravert, the person high on the extraversion dimension, has been described by Eysenck and Eysenck (1964) as

sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment, and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes change; he is carefree, easygoing, optimistic, and likes to laugh and be merry. He prefers to keep moving and doing things, tends to be aggressive and lose his temper quickly; altogether his feelings are not kept under tight control, and he is not always a reliable person (p. 8).

In contrast to the typical extravert, the person low on the extraversion dimension, the introvert, is described

by Eysenck and Eysenck as

a quiet, retiring sort of person, introspective, fond

of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, 'looks before he leaps', and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness, and likes a well oriented mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and does not lose his temper easily. He is reliable, somewhat pessimistic and places great value on ethical standards (p. 8).

Factor analytic studies of personality have identified extraversion as one of the most reliably isolated dimensions of personality (Eysenck and Eysenck, 1968). The relationship between divergent thinking and personality components of extraversion will be considered in the following section.

Studies using adult samples are discussed first. In this group of studies the following personality assessment procedures used were:

- (1) questionnaires (Barron, 1955; Barron, 1957; Garwood, 1964; Hitt and Stock, 1965; Merrifield, Guilford, Christensen and Frick, 1961; Stimson, 1968).
- (2) rating scales (Barron, 1955; Barron, 1957) and
- (3) check lists (Barron, 1955; Barron, 1957; Maddi, 1965; Stimson, 1968; Weiser, 1970).

Divergent thinking measures were also varied, ranging from the Rorschach (Barron, 1955; Barron, 1957) and Thematic Apperception Tests (Maddi, 1965) to the Uses Test (Barron, 1955; Barron, 1957; Weiser, 1970). Some studies have employed a wide variety of assessment procedures in an attempt to measure a large number of personality variables

(Barron, 1955; Barron, 1957; Stimson, 1968). An

investigation by Barron (1957) exemplifies this approach.

Barron examined a sample of 100 Air Force officers

over three days in a live-in situation. The officers were

rated on a wide variety of characteristics, and tested

using divergent thinking tasks, personality questionnaires

and adjective check lists. Exploration of relationships

between divergent thinking and an extensive number of

personality traits was made. High performances on diver-

gent thinking tasks were significantly associated with (1)

ability to integrate diverse stimuli, (2) energy, fluent

output and involvement, (3) personal dominance and self

assertion, (4) responsiveness to impulse and emotion,

(5) expressed femininity of interest, and (6) general work

effectiveness during the 3-day study. It is important to

note that fluent output, personal dominance and self

assertion, and responsiveness to impulse and emotion are

basic components of extraversion. Conformity and rigidity

were associated with low scores on the divergent thinking

tasks.

Other studies have also reported findings consistent

with those of the Barron (1957) study. Significant

positive relationships have been reported between divergent

thinking and the following variables:

(1) Impulsivity (Barron, 1955; Garwood, 1964; Guilford,

1967; Maddi, 1965; Merrifield, Guilford, Christensen

and Frick, 1961; Stimson, 1968; Weiser, 1970),

- (2) sociability and social assertiveness (Barron, 1955; Hitt and Stock, 1965; Merrifield, Guilford, Christensen and Frick, 1961; Garwood, 1964),
- (3) nonconformity (Garwood, 1964),
- (4) unconventionality (Weiser, 1970),
- (5) tendency to seek out new experiences (Maddi, 1965; Stimson, 1968; Weiser, 1970).

The studies cited above suggest that the person who performs well at divergent thinking tasks tends to be impulsive, sociable, unconventional, non-conforming and socially assertive, and to seek out new experiences.

Additional support for the relationship between divergent thinking and extraversive traits is provided by the following six investigations employing children and adolescent subjects. Much of the current work in the area of divergent thinking has been stimulated by the research of Getzels and Jackson (1962) and Hudson (1966). Getzels and Jackson studied the relationships between creativity and both intelligence and other personal characteristics. Tests of divergent thinking were used as measures of creativity in a sample of intellectually gifted children (mean IQ 132, S.D. 15). Two sub-groups of individuals were identified, one high in intelligence (IQ) and relatively low on divergent thinking, and one high in divergent thinking and relatively low in IQ. Both sub-groups were significantly above the original total sample

in school achievement, but there was a 23 IQ point mean difference between them. Getzels and Jackson found that:

(1) Need for achievement did not differ between the two groups.

(2) The high IQ sample were better known and better liked by their teachers.

(3) The high IQ sample tended to be more conventional in career choice and more oriented towards conventional values and the conventional standards of success than the high divergent thinking group.

(4) The high divergent thinking group was relatively more playful, impulsive, and able to express wit and violence.

(5) Correlations between verbal achievement and divergent thinking were as great as, or greater than those between verbal achievement and IQ.

In the Hudson (1966) study divergent thinking was considered in the context of an investigation of differences in ability between arts and science specialists in secondary school students. Hudson found that those low on divergent thinking are prone to compartmentalize from one topic to another, concentrate on the impersonal aspects of the culture, have stereotyped reactions to controversial issues, be discreet in the expression of what they feel, and dislike ambiguity. In contrast, divergers tend to be

interested in the human aspect of culture, liberal in attitude and less inclined to accept beliefs on trust, unconventional in thinking style, weak at precise logical argument, open in expressing feelings about personal matters, and to shun the technical and practical.

The samples in both the Getzels and Jackson and Hudson studies were high in level of ability; the Getzels and Jackson sample had an average IQ of 132, while Hudson chose his sample on the basis that every member of it would have a good chance of going to university if he wished. The personality data obtained in the two studies are remarkably consistent; the higher IQ subjects tended to be conforming, conservative, and imbued with conventional standards. The divergers were non-authoritarian, liberal in attitude and able to express their feelings more readily.

The findings of the Getzels and Jackson and Hudson investigations have received considerable support from a number of other studies (Anderson and Cropley, 1966; Torrance, 1963; Wallach and Kogan, 1965; Weisberg and Springer, 1961). In general, work on children and adolescents indicates that those who are good at divergent thinking tend to be emotionally expressive, non-conforming, flexible and sociable. Thus in both children and adolescents and in adults it would appear that divergent thinking is positively related to extraversive personality characteristics.

Divergent Thinking and Extraversion

In 1967 Eysenck postulated that divergent thinking tests were measuring an extraversive response set or style. Studies which bear directly on Eysenck's hypothesis are discussed in this section. As with much of the previously discussed work a variety of personality and divergent thinking measures has been used. Extraversion has been assessed using behaviour ratings (Rogers, 1956), the Myers-Briggs Type Indicator (MBTI) (Anderson and Cropley, 1966; Ohnmacht, 1970), The Hysteroid-Obsessoid Questionnaire (HOQ) (Ryle, 1968); the Bernreuter Questionnaire (Iwata, 1968; Soueif and El-Sayed, 1970), the 16 Personality Factor Questionnaire (16PF) (White, 1968), the Maudsley Personality Questionnaire (MPI) (Taft, 1967, 1971), and the Eysenck Personality Inventory (EPI) (Di Scipio, 1971; Innes, 1972).

As early as 1954 Rim investigated the relationships between fluency, perseveration and extraversion. The relevant hypotheses in his study were (1) "oral verbal fluency is a unitary factor of personality", and (2) "oral verbal fluency is a measure of introversion-extraversion" (p. 326). He administered a test battery which included tests of fluency to 121 neurotic psychiatric patients and 25 normals. Extraversion was defined by the psychiatric groups, hysterics being classed as extraverts and dysthymics as introverts. Rim found that the tests of fluency did not differentiate between hysterics and dysthymics. However

it is unlikely that Rimm's study was a fair test of this hypothesis as recent evidence suggests that psychiatric patients tend to be introverted and lacking in inter-

personal skills (Haywood, 1970). This difficulty was overcome in a study by Rogers (1956) who used questionnaires and behaviour ratings to measure extraversion in a sample of school children. Rogers reported that extraversion was positively related to divergent thinking.

Later investigations will be considered in three

sections: (1) Studies which support the hypothesis of a positive relationship between extraversion and divergent thinking, (2) Studies which suggest there is a positive relationship between extraversion and divergent thinking, (3) Studies which fail to provide support for a positive relationship between extraversion and divergent thinking.

In the first group research by Anderson and Cropley (1966), Di Scipio (1971), Taft (1967), and White (1968) has demonstrated a positive relationship between divergent

thinking variables and extraversion. Anderson and Cropley measured personality correlates of originality in a sample of school children and found a significant positive relationship between originality and extraversion. Using university students as subjects Taft (1967) demonstrated a positive relationship between fluency and extraversion.

Both Di Scipio (1971) and White (1968) used university students in their samples. White (1968) reported that

subjects high on extraversion gained higher scores on the divergent thinking variables flexibility, fluency and originality than subjects low on extraversion. Further, subjects low in anxiety gained higher scores on the divergent thinking tasks. White also found an interaction between extraversion and anxiety (measured on the 16PF) in their relationship with divergent thinking variables. Subjects high in extraversion and low in anxiety tended to have high originality scores relative to subjects in other categories. In the Di Scipio (1971) study fluency correlated positively with extraversion. Di Scipio used four groups of subjects in a 2 x 2 factorial design. The groups were stable extraverts, neurotic extraverts, stable introverts and neurotic introverts. He found an interaction effect between extraversion and neuroticism (measured by the Eysenck Personality Inventory) on fluency. In particular Di Scipio found that (1) stable extraverts were more fluent than stable introverts, (2) stable extraverts were more fluent than neurotic extraverts, and (3) neurotic introverts were more fluent than stable introverts.

Although the four studies discussed above differed in methodology, measures of extraversion, and divergent thinking tests, they are consistent in finding a positive relationship between extraversion and divergent thinking variables.

In four other studies there is some suggestion that divergent thinking is related to extraversion (Iwata, 1968; Ohnmacht, 1970; Soueif and El-Sayed, 1970; Taft, 1971).

Iwata (1968) studied divergent thinking in high school and university students. His divergent thinking tests included the Unusual Uses Test, the Consequences Test, and the Association of Homonyms Test. The personality test used was a revised version of the Bernreuter Personality Inventory (Kobayashi and Kondo, cited in Iwata, 1968). He analysed his results in three different ways. First, a comparison was made between subjects in the upper 50% on the divergent thinking tests and in the lower 50% on intelligence tests, and subjects in the lower 50% on divergent thinking and in the upper 50% on intelligence tests. In this comparison there were no significant differences between the two groups in personality characteristics.

In Iwata's second analysis a small number of his subjects were matched in pairs for intelligence (IQ) to form two groups. One subject in each matched pair had a divergent thinking Z score of -1.50 or less and the other a divergent thinking Z score of $+1.50$ or greater. Again there were no significant differences between the two groups in personality characteristics. Iwata's third analysis tested for a relationship between various sub-tests of divergent thinking and personality characteristics. Those subjects high on ideational fluency were significantly more sociable and dominant than those low on ideational fluency. In summary only one of Iwata's three analyses provided evidence for a positive relationship between extraversion and divergent thinking.

Ohnmacht (1970) tested for a relationship between five measures of divergent thinking and the personality measures in the Myers-Briggs Type Indicator. One of the divergent thinking scales, the Utility test, related positively and significantly to the extraversion scale. Ohnmacht examined a large number of correlations in this study and this result must be regarded as equivocal because of the high probability of a Type 1 error.

In another study Soueif and El-Sayed (1970) attempted to find relationships between divergent thinking measures and personality variables using a sample of male university students. Ninety-two per cent of the intercorrelations between divergent thinking tests and personality tests failed to differ significantly from zero. However moderator analysis revealed complex interaction effects between the divergent thinking and personality variables, extraversion being an effective moderator variable. Nevertheless perusal of their correlation tables indicates that there was no simple single interaction effect between divergent thinking and personality. The complexity of the interaction effects is illustrated in the following quote:

Thus in the presence of extraversion, intolerance of ambiguity is detrimental to cleverness. Because extraverts tend to be social-environment dependent, so intolerance of ambiguity would possibly make them very near to social conformity, hence averting some aspects of originality. By the same token extraversion if coupled with self sufficiency is not detrimental to originality. Perhaps self sufficiency

tempers extraversion to some extent. It is interesting to note, here that extraversion and self sufficiency seem to be the opposite to each other judging from the slight negative correlation between the two variates. The relationship between creative abilities and K, a measure of ego integration, is also effected by extraversion. In introverts and medium extraverts some originality variables are positively correlated with ego integration, but only introverts have ego integration positively correlated with tests of thought flexibility. In other words introversion allows for ego integration to go hand in hand with both originality and flexibility, but a moderate dose of extraversion would cancel out the correlation for flexibility variables. (Soueif and El-Sayed, 1970, p.18).

Further limited evidence is provided in a study by Taft (1971) who reported that originality as measured by the Guilford Uses Test failed to correlate significantly with extraversion as measured by the Maudsley Personality Inventory. However there was a significant positive correlation between originality (judged from Thematic Apperception Test stories) and extraversion. Nevertheless it may be that originality as measured by the Thematic Apperception Test is a somewhat different entity from that assessed by the Uses Test (which is used in the present thesis).

Although the four studies discussed above are difficult to interpret they appear to offer qualified support to the notion that divergent thinking is related to extraversion. Iwata (1968), Ohnmacht (1970) and Taft (1971) suggest a direct relationship while Soueif and El-Sayed (1968) reported interaction effects between divergent thinking, extraversion, and other personality variables.

Finally two researchers reported failure to find a positive relationship between extraversion and divergent thinking (Hudson, 1968; Innes, 1972). Hudson discussed a study of his own and an unpublished study by Kyle (Hudson, 1968, p. 80). Hudson gave insufficient information regarding his sample and measures for a full report on his study. Kyle found no significant relationship between scores on the Uses of Objects test and the Hysteroid-Obsessoid Questionnaire, a scale measuring extraversion (Hudson, 1968, p. 80). In the study by Innes (1972) a sample of male and female undergraduates were given tests of fluency and originality, and the Eysenck Personality Inventory. There were no significant correlations between the personality and divergent thinking variables.

In summary five studies have offered substantial support for the hypothesis that divergent thinking is positively related to extraversion (Anderson and Cropley, 1966; Di Scipio, 1971; Rogers, 1956; Tatt, 1967; White, 1968). A further four studies find limited support for the hypothesized divergent thinking - extraversion relationship (Iwata, 1968; Ohmachi, 1970; Soule and El-Sayed, 1970; Tatt, 1971). Three studies show evidence for interaction effects in the relationship between divergent thinking and extraversion (Di Scipio, 1971; Soule and El-Sayed, 1970; White, 1968). Failure to support the divergent thinking - extraversion hypothesis was reported by three researchers

(Hudson, 1968; Innes, 1972; Rim, 1954).

Thus most of the evidence indicates that there is a positive relationship between divergent thinking and extraversion, although the exact nature of this relationship is unclear. Chapter IV reports a study aimed at further elucidating the relationship between divergent thinking and extraversion.

CHAPTER IV

STUDY I

CHAPTER IV

STUDY I

Aims

In Chapter III it was suggested that there is a positive relationship between divergent thinking and extraversion. It was decided to test this proposition on a sample of young adolescents, as little previous research has been conducted on the relationship between personality variables and divergent thinking with such subjects (Dacey and Ripple, 1969). Further, it appeared that only one investigation has studied the relationship between divergent thinking and extraversion in a sample of young adolescents (Anderson and Cropley, 1966). The hypothesis in the present study was that both fluency and originality, two aspects of divergent thinking, would be positively and linearly related to extraversion. It was proposed to test the hypothesis on a sample of boys and a sample of girls. The samples were to be as nearly as possible of the same age, level of intelligence and socio-economic background. It was planned to determine whether the same relationships could be established in both samples.

The New Junior Maudsley Inventory (NJMI) was selected as the instrument to measure extraversion. This inventory

enabled exploration of the relationships between divergent thinking and both neuroticism and tendency to dissimulate (L scale) (Eysenck, Eysenck and Shaw, 1974). The relationship between divergent thinking and neuroticism (or anxiety)¹ would appear to be unclear because (i) as with other aspects of the study of divergent thinking many reports confound the notion of creativity with that of divergent thinking (Hudson, 1966), and (ii) there are conflicting reports on the relationship between divergent thinking and neuroticism.

The possible complexity of the relationship between divergent thinking and anxiety is illustrated by Wallach and Kogan (1965) who showed in a sample of boys that there appeared to be a curvilinear relationship between divergent thinking and anxiety. Those subjects with high divergent thinking scores reported a middling degree of anxiety while those with low divergent thinking scores reported anxiety at either end of the anxiety dimension. A complex relationship between divergent thinking and neuroticism was also reported by Di Scipio (1971) who reported that

(1) In this section the two terms neuroticism and anxiety are used interchangeably since neuroticism as measured by the Eysenck inventories correlates highly with questionnaire measures of anxiety (Spielberger, 1972), and neuroticism and anxiety are often considered as synonymous (Kahn, Wolfe, Quinn, Snoek and Rosenthal, 1964).

"neuroticism is found to decrease the fluency of extraverts and increase the fluency of introverts" (p. 549). By comparison Wallach and Kogan (1965) found no significant relationship between divergent thinking and anxiety in their sample of girls. Failure to demonstrate divergent thinking - anxiety relationships was also reported by Dacey and Ripple (1969), Feldhusen, Denny and Condon (1965), Vidler and Karan (1975) and Wadia and Newell (1963). In contrast White (1968) and Dentler and Mackler (1964) report a significant negative relationship between divergent thinking and anxiety. Thus it would appear that the nature of any relationship between divergent thinking and neuroticism or anxiety is unclear and it would seem prudent to make no specific predictions regarding such a relationship in the present study on adolescent subjects. Similarly specific predictions were not made regarding a divergent thinking - tendency to dissimulate relationship, as there appeared to be no available evidence to indicate such a relationship. Further the personality characteristics measured by the L scale are unclear although it appears that L scales may be measuring a tendency to dissimulate or fake good, and an inaccurate and uninsightful but honest self assessment (Eysenck, Eysenck and Shaw, 1974).

However the NJMI measures both neuroticism and tendency to dissimulate, and it was decided to take advantage of this convenient opportunity to examine the relationships between divergent thinking and neuroticism and divergent

thinking and tendency to dissimulate.

Methodological Problems

In testing the hypothesis there were a number of methodological points which warranted consideration. These included the need to control subject variables such as intelligence, age range, school situation, and residential area. In particular there was a special need to control variables relating to the test situation. Thus the test instructions and 'mood' created by the situation should be consistent across different testing situations (Hudson, 1968; Levy, 1968; Torrance, 1969; Wallach and Kogan, 1965).

The extent to which intelligence is related to divergent thinking ability has been the subject of debate (Butcher, 1968). Some studies have found that intelligence contributes significantly to productivity in divergent thinking, suggesting that level of intelligence should be controlled (Barron, 1968; Clark, Veldman and Thorpe, 1965; Cropley, 1966; Rogers, 1956; Torrance, 1963b). However, in populations which are relatively homogeneous with respect to intelligence there appears to be little if any relationship between divergent thinking and intelligence test scores. Under such conditions relationships between divergent thinking and other variables may become more

apparent (Cropley and Maslany, 1969; Getzels and Jackson, 1962; Hudson, 1966; Kogan, 1971).

Description of the Sample

The subjects comprised 44 male first year students from Newtown High School and 43 female first year students from Ogilvie High School, two Hobart High Schools. The approximate size of each sample was chosen such that relationships significant at the 5 per cent level would account for at least 10 per cent of the variance. Ready access to such samples was available with the full co-operation and interest of the education authorities. The two high schools draw their school populations from the same area in the City of Hobart, so it was assumed that variables such as socio-economic background were controlled. Both groups were in the average range of intelligence (90-109) as measured on a standard school group intelligence test.⁽¹⁾ The average age of the boys was 12 years 10 months, with a range from 12 years to 13 years 11 months. The mean age

(1) This test was "the ten year old intelligence test", which has been administered annually to all ten year olds in Tasmanian State Schools since 1945. Each year's test is devised by the staff of the Guidance Office of the Education Department of Tasmania. They are written tests administered by the class teacher and resemble Otis tests in construction and method of administration. All questions are of the verbal type. The test comprises 100 items and occupies one hour.

of the girls was 12 years 6 months, with a range from 11 years 10 months to 13 years 8 months.

The selection of the samples was arranged by the School Guidance Officer of each high school without the supervision of the researcher. Strict random selection proved impracticable. Testing the children in the schools demanded considerable upset of several classes as the children in each school were not streamed into academic levels. That is, subjects had to come from a number of classrooms and assemble in a separate classroom.

Instruments

Two tests were used:

1. The Uses Test
2. The New Junior Maudsley Inventory (NJMI) (Furneaux and Gibson, 1966).

The Uses Test was chosen as a direct measure of divergent thinking. It is a verbal test, and can be scored for both originality and fluency. It is similar to that used by Wilson, Guilford and Christensen (1953), and has been used many times since in research on divergent thinking. In the present study the subjects were asked to write down as many unusual uses as they could for the following objects: Brick, Knife, Blanket, and Chair. The specific instructions were printed on the test form and were

as follows:

Listed below are four objects. Your task is to write down as many different uses as you can for each object. There are no right or wrong answers, so try to think of as many different and unusual uses as you can. Write down anything that comes to mind, no matter how strange it may seem.

The experimenter read out these instructions and then described an example as follows:

Think about a piece of string. (Pause) A piece of string can be used as a fishing line, a high jump bar, to measure something, for sewing, to pull something along. There are probably lots of other things it can be used for as well.

A slight pause followed, after which the children were asked to start on the actual task. The use of string as an example followed Wallach and Kogan (1965). A sample of the test form is shown in Appendix (A).

The NJMI was chosen as a measure of extraversion for the following reasons:

- (1) It had been developed as a measure of the traits extraversion and neuroticism along the lines of other tests developed by the Maudsley group of workers under Eysenck,
- (2) it was readily available and in constant use at a child guidance clinic where the author worked, and
- (3) the test appeared to be more suitable for the age and intelligence range of children in the sample chosen than the potential alternative test, the Junior Eysenck Personality Inventory (cf. Harbison, 1970).

The NJMI is a self-report 43-item questionnaire designed to

measure extraversion, neuroticism, and tendency to dis-simulate (L scale). Furneaux and Gibson (1966) have provided limited reliability data for the extraversion and neuroticism scales. For extraversion they found test-retest reliability coefficients of 0.94 over three weeks and 0.74 over one year. For neuroticism the test-retest reliability coefficient was 0.84 over one week. Furneaux and Gibson (1966) also review evidence which indicates that the NJMI is measuring similar attributes to those measured by the Eysenck Personality Inventory (EPI) and the Maudsley Personality Inventory (MPI). These two tests measure extraversion and neuroticism. In addition studies by McAllister and Marshall (1969) and Harbison (1970) indicate that the measures of extraversion and neuroticism in the New Junior Maudsley Inventory are strongly related to the measures of extraversion and neuroticism on the Junior Eysenck Personality Inventory.

The test was administered according to the standard instructions as set out in the manual. The test is scored using a template and three scores are derived: an extraversion score, a neuroticism score, and an L scale score.

Procedure

There were two test sessions, one for girls and one for boys. At each test session the groups were assembled in one

large classroom and the researcher gave the tests according to the standard instructions with the Personality Inventory being administered first. The procedures were the same for each test session. The testing conditions were similar to most teaching situations. However an effort was made to create a permissive atmosphere as suggested by Wallach and Kogan (1965). Some attempt was made to relax the students and explain that this was not a test in any normal sense. The researcher was initially introduced to the subjects by the School Guidance Officer as a Psychologist who was doing research.

The introductory explanation took the following form:

I am a psychologist, and I am going to give you two tests as part of an experiment. I am interested in the group results and not in any individual's. I shall be the only one to see your individual results, and no-one else will know how each one of you got on. I think you will find the tests interesting, and I shall explain each one as we come to it. If you have any questions - if you are not sure about something, don't hesitate to ask me.

Each test session took approximately one period of 45 minutes. Only one person exceeded this amount of time and she was allowed to continue. There was no pressure on the students to finish the tests in a given time.

Scoring

Two scores were derived from the Uses Test:

- (1) A fluency score, and

(2) An originality score.

The fluency score was simply a count of the number of discrete uses for an object given by each subject. In obtaining the fluency score each response was checked to ensure that those scored were relevant, discrete and different from other responses given by the subject. The originality score was a total score derived from the statistical frequency of each of a subject's responses. If a response occurred once in the entire response population it rated an originality score of two points. If it occurred two, three or four times it rated an originality score of one point. Responses occurring more than four times scored 0 points. The scoring of originality does not pose any serious problems if the procedures involved are clearly and objectively defined. In this study the responses of the entire sample of both boys and girls were used as the response pool for assessing originality. This was to ensure the largest possible pool of responses against which to score each individual response.

Results

The scores for each subject were tabulated and means and standard deviations for each scale calculated. Subjects had scores for extraversion (E), neuroticism (N), L scale (L), originality (O) and fluency (F). These scores were

intercorrelated separately for the males and females.

The means (M) and standard deviations (S. D.) for both girls and boys are shown in Table 1. The t values were calculated for the mean differences between the girls and boys on each measure. It is apparent that girls had a higher L scale score than boys ($t = 2.92, p < 0.01$), and produced significantly more original responses than boys ($t = 2.28, p < 0.05$).

TABLE 1
Means and Standard Deviations for each of the
Scales shown separately for Girls and Boys.

	Girls (N = 43)		Boys (N = 44)		
	M	S. D.	M	S. D.	
Extraversion (E)	11.16	2.84	12.14	2.74	N.S.
Neuroticism (N)	8.65	3.08	7.59	3.49	N.S.
L scale (L)	8.28	3.80	6.07	3.14	$p < 0.01$
Originality (O)	5.30	5.89	2.91	3.63	$p < 0.05$
Fluency (F)	22.56	6.71	21.66	6.65	N.S.

Table 2 shows intercorrelations between the five scales for the female sample. It is apparent that there is virtually

no relationship between the divergent thinking variables and extraversion (fluency - extraversion, $r = 0.02$; originality - extraversion, $r = 0.00$). Similarly the divergent thinking variables are unrelated to neuroticism (fluency - neuroticism, $r = -0.03$; originality - neuroticism, $r = 0.09$). However there is a significant negative relationship between the L scale and both fluency ($r = -0.31$, $p < 0.05$) and originality ($r = -0.31$, $p < 0.05$). There is a significant and moderately high correlation between the two divergent thinking variables fluency and originality ($r = 0.57$, $p < 0.01$).

It should be noted that while extraversion is not significantly related to the divergent thinking variables the L scale is significantly related to both extraversion and the divergent thinking measures. However the variance associated with the extraversion - L scale and the L scale - divergent thinking relationships is not overlapping, and the extraversion - L scale correlation is not relevant to the hypotheses being examined.

TABLE 2
Inter-scale Product Moment Correlations for
the Girls.

	E	N	L	F	O
Extraversion (E)	1.00				
Neuroticism (N)	-0.02	1.00			
L scale (L)	-0.34*	-0.13	1.00		
Fluency (F)	0.02	-0.03	-0.31*	1.00	
Originality (O)	0.00	0.09	-0.31*	0.57**	1.00

* $p < 0.05$
** $p < 0.01$

Table 3 shows intercorrelations between the five scales for the male sample. It is apparent that the divergent thinking variables do not correlate significantly with each other or with any of the personality variables.

TABLE 3
Inter-scale Product Moment Correlations for the
Boys.

	E	N	L	F	O
Extraversion (E)	1.00				
Neuroticism (N)	-0.06	1.00			
L scale (L)	-0.20	-0.16	1.00		
Fluency (F)	-0.12	-0.19	0.02	1.00	
Originality (O)	0.02	0.22	0.04	0.09	1.00

In summary the results indicate that:

(1) There is no significant relationship between the two divergent thinking variables and extraversion in both the male and female samples.

(2) The two measures of divergent thinking, fluency and originality, correlate significantly and positively in the female sample but not the male sample.

(3) The female sample produced significantly more original responses and was significantly more fluent than the male sample.

(4) There is a significant negative correlation between the two divergent thinking variables and the L scale of the NJMI for the female sample only.

Discussion

The results fail to support the hypothesis that divergent thinking and extraversion are significantly and positively related. This is in accordance with the reports of Hudson (1968), Innes (1972) and Rim (1954), but does not rule out the possibility of an interaction effect between extraversion, neuroticism and divergent thinking. The more complex analysis required for interaction effects could not be undertaken with the samples studied as there were insufficient subjects. Clearly there is a need to examine larger groups of girls and boys of this age group to test for interaction effects.

The only significant correlations between divergent thinking and the personality variables occurred in the group of girls. In this sample there was a significant negative correlation between the L scale and both fluency and originality. Although the characteristics measured by L scales are open to doubt (Vernon, 1964), in the NJMI, the L scale is thought to measure tendency to dissimulate in the direction of socially desirable behaviour. It has been suggested that a high scorer is trying to make himself out as a "moral paragon" and is somewhat defensive, while a low scorer may be tending to boast about bad behaviour and doing socially unacceptable things (Furneaux and Gibson, 1966, p. 10-11). The relationship between the divergent

thinking variables and the L scale suggests that the defensive girl is worse at divergent thinking than the uninhibited and/or boastful girl. This hypothesis is consistent with Anderson and Cropley's (1966) notion that the person good at divergent thinking has not learnt "stop rules" in thinking. However some caution must be exercised regarding this interpretation as the result was found only for the sample of girls. In addition little is known about the L scale, particularly in female samples (Furneaux and Gibson, 1966, p. 11-12), and the result may be an artifact of the particular situation.

The finding that the two divergent thinking scales were positively correlated for the female sample but not for the male sample is difficult to explain, as the samples were drawn from similar school populations and testing procedures were identical. The absence of a correlation between the two divergent thinking measures in the males is also at variance with the findings of previous researchers (Wallach and Kogan, 1965). It may be that the sex difference in the originality - fluency, originality - L scale, and fluency - L scale relationships results from differences in the variances of scores. It is apparent from Table 1 that the variance in the L scale, originality and fluency scores is slightly greater for the girls than the boys. Alternatively different biological, cultural and environmental influences including the effects of a different school environment may

account for the differences. That is, even though the populations are from the same socio-economic and geographic backgrounds, they are from different schools, and school influences could be confounded with biological differences. It is difficult to elucidate reasons for the sex differences because of such uncontrolled factors. Nevertheless the issue of sex differences demands some attention as there has been a relative absence of research in this area (Bhavnani and Hutt, 1972; Carlson and Carlson, 1960; Garai and Scheinfeld, 1968).

In summary the findings of this study did not support the hypothesis that there is a relationship between divergent thinking and extraversion, and there is no evidence that divergent thinking and neuroticism are related. The finding in the female sample of a relationship between divergent thinking and L (tendency to dissimulate) has interesting implications as discussed above. However this result was not apparent in the male sample and thus may have been an artifact of the particular testing situation in the female sample. In order to examine the stability of the effect the sample of girls was retested fourteen months later. This investigation is reported in Chapter V.

CHAPTER V

STUDY II

ality measures.

test-retest data for both the divergent thinking and person-

Therefore the second testing provided valuable long term

data for the measures for this age group over a lengthy period.

measures. There is a relative lack of test-retest reliability

correlations on both the divergent thinking and personality

added advantage of providing useful test-retest reliability

The decision to use the same female sample had the

testing (Study I).

by the T scale on the NIMI as was found in the initial

negatively correlated with tendency to disassociate measured

It was hypothesized that divergent thinking would be

divergent thinking tests (Bhavnani and Nutt, 1972).

girls tend to perform more consistently than boys on

retest only the female sample because it has been noted that

months after the original testing. It was decided to

relatively long period. The retest was made fourteen

stability of the relationship within the same sample over a

decided to retest the original female sample to examine the

disassociate warranted further investigation, and it was

correlation between divergent thinking and tendency to

As noted in Chapter IV the finding of a negative

STUDY II

CHAPTER V

Procedure

A reduced sample of 34 girls from the original sample of 43 were tested again fourteen months after the first testing. The 9 girls who were not tested on this occasion were either absent from school, or had transferred to another school. The average age of the girls was 13 years 8 months, with a range from 12 years to 14 years 10 months.

The procedures used were identical with those used in the first testing. Testing was conducted at the same time and day of week but in a different room of the school.

The scores were derived by the method used at the initial testing, and the scores from the two sets of testing were intercorrelated to establish product moment correlations. The means and standard deviations were also calculated.

Results

Product moment correlation figures for the reduced sample on the first testing together with the corresponding figures for the full sample are shown in Table 4.

TABLE 4

Product Moment Correlation Figures for the Reduced Sample (N = 34) and Full Sample (in brackets, N = 43) on First Testing.

	E	N	L	F
Extraversion (E)	1.00			
Neuroticism (N)	-0.03 (-0.02)	1.00		
L scale (L)	-0.31 (-0.34) *	-0.14 (-0.13)	1.00	
Fluency (F)	-0.06 (0.02)	+0.03 (-0.03)	-0.26 (-0.31)	1.00
Originality (O)	-0.04 (0.00)	+0.11 (+0.09)	-0.35 [*] (-0.31) *	0.57 ^{**} (0.57) **

* p < 0.05

** p < 0.01

It is apparent from Table 4 that the reduction in size of the sample has only a marginal effect on the correlation coefficients. No relationship changes by more than 0.09. The reduction in sample size and associated slight change in correlation coefficients mean that two relationships which were regarded as significant in the first testing would be regarded as not significant in the reduced sample in Study II:

- (1) The correlation between extraversion and the L scale, and
- (2) The correlation between fluency and the L scale. The

correlation between originality and the L scale is slightly higher in the reduced sample. Thus the exclusion of 9 subjects from the original sample has produced a negligible effect in the correlation matrix, and an examination of the relationships in a second testing would appear warranted. This decision is further justified by the close similarity between the means and standard deviations of the reduced sample (n = 34) and the original sample of girls (n = 43) on the first testing (Table 5).

TABLE 5
Means (M) and Standard Deviations (S.D.) of
Original Sample of Girls and Reduced Sample
on each Scale for First Testing.

		Original Sample		Reduced Sample	
		N = 43		N = 34	
		M	S. D.	M.	S. D.
Extraversion	(E)	11.16	2.84	11.29	2.87
Neuroticism	(N)	8.65	3.08	8.71	3.25
L scale	(L)	8.28	3.80	7.94	3.69
Fluency	(F)	22.56	6.71	23.04	6.66
Originality	(O)	5.30	5.89	5.85	6.33

The correlation matrix resulting from the second testing on the reduced sample is shown in Table 6.

TABLE 6

Product Moment Correlation Coefficients between all Scales used on the Second Testing.

	E	N	L	F	O
Extraversion (E)	1.00				
Neuroticism (N)	+0.21	1.00			
L scale (L)	-0.40*	-0.48**	1.00		
Fluency (F)	-0.04	+0.05	-0.04	1.00	
Originality (O)	+0.03	+0.22	-0.10	+0.37*	1.00

* $p < 0.05$

** $p < 0.01$

It is shown that there is a failure of any of the personality variables to correlate significantly with the divergent thinking variables. In particular the hypothesis that the L scale would relate to the divergent thinking variables is not supported. The relationship between fluency and originality is positive and significant ($r = 0.37$, $p < 0.05$).

There is a significant negative correlation between neuroticism and the L scale whereas this relationship was

not significant in the first testing. This discrepancy is not directly relevant to the hypotheses being examined, yet probably relates to the poor test-retest reliability data discussed later.

A comparison between the first and second testing for the reduced sample of the means and standard deviations for each of the personality and divergent thinking variables is shown in Table 7.

TABLE 7

Means (M) and Standard Deviations (S. D.) for each Variable from the two Sets of Testing (N = 34).

	1st Testing		2nd Testing	
	M	S. D.	M	S. D.
Extraversion (E)	11.29	2.87	12.18	3.42
Neuroticism (N)	8.71	3.25	8.62	3.88
L scale (L)	7.94	3.69	6.71	3.45
Fluency (F)	23.03	6.66	25.56	7.08
Originality (O)	5.85	6.33	5.29	7.83

Tests of significance on the differences between the means in Table 7 show a significant difference between the mean extraversion scores ($t = 2.14$, $p < 0.02$), and between

the L scale means ($t = 2.62$, $p < 0.01$). There is no significant difference between the first and second testing means of fluency, originality and neuroticism. Thus there has been a significant increase in the group's mean score on extraversion and decrease in the group's mean score on tendency to dissimulate.

Test-retest correlations on the divergent thinking and personality variables are shown in Table 8.

TABLE 8
Test-Retest Produce Moment Correlation
Coefficients (N = 34).

Extraversion (E)	+0.31	N.S.
Neuroticism (N)	+0.63	$p < 0.01$
L scale (L)	+0.36	$p < 0.05$
Fluency (F)	+0.41	$p < 0.01$
Originality (O)	+0.30	N.S.

Reliability coefficients were significant for three scales, the neuroticism scale (+0.63), L scale (+0.36), and the fluency measure (+0.41). Although significant the reliability coefficient for the L scale appears inadequate for research over extended periods. The reliability coefficient for neuroticism is a quite acceptable value for research in this area. The reliability figures for both

fluency and originality seem unacceptably low for research relating personality variables to behavioural measures.

Discussion

Important aspects of the results of the second testing are:

(1) The significant changes in the group mean scores on the E and on the L scales.

(2) The relatively low test-retest correlations on each of the scales with the exception of the neuroticism scale, and

(3) The absence of any significant correlations between the personality measures and the divergent thinking variables.

The changes in group means for the E and L scales indicate that over the period of fourteen months, the girls became more extraverted and exhibited less of the tendency to dissimulate. These results may reflect the growing maturity of the girls, increased confidence in the testing situation, or the influence of other uncontrolled measurement variables. The low test-retest reliabilities of all scales except the N scale would be consistent with any personality and cognitive changes which had occurred over the 14-month inter-test period. Further, the failure to obtain a significant relationship between the L scale and divergent thinking

variables suggests that the original correlation between L and divergent thinking in the sample of girls in Study I may have been a Type 1 error.

While the results indicated that extraversion and divergent thinking were not time stable from the first to second testing, this lack of reliability does not logically preclude the existence of a stable relationship between extraversion and divergent thinking. It should be noted that both testings of divergent thinking were untimed as recommended by Wallach and Kogan (1965). However it has been reported by Eysenck (1967) that extraverts work more quickly and show less persistence than introverts. Therefore it may be that in Studies I and II a positive relationship between extraversion and divergent thinking was obscured to the extent that extraversion was related to speed of performance on the divergent thinking test.

In order to eliminate potential error associated with the timing of testing it was decided to conduct an experiment to assess the relationship between divergent thinking and extraversion in a comparable sample of school girls under both timed and untimed divergent thinking test conditions. This study is reported in Chapter VI.

CHAPTER VI

STUDY III

CHAPTER VI

STUDY III

As noted in Chapter V a relationship between extraversion and divergent thinking may have been obscured by a relationship between extraversion and speed of completion of the divergent thinking tests. While researchers such as Wallach and Kogan (1965) have used untimed tests to provide more relaxed conditions and permit the expression of divergent material, there has been no consistent approach apparent in previous research to the problem of timed versus untimed tests in the study of divergent thinking and extraversion. For example studies by Di Scipio (1971), Innes (1972), Iwata, (1968), Rim (1953) and Souief and El Sayed (1970) used timed divergent thinking tests, Hudson (1968) used untimed divergent thinking tests, while in other studies it is not clear whether the divergent thinking tests were timed or untimed (Anderson and Cropley, 1966; Taft, 1971; White, 1968). In addition, while both Nichols (1971) and Cropley (1972) show that there is a positive relationship between scores on timed and untimed divergent thinking tests, Nichols (1971) indicates that a difference in method of testing could effect outcomes of many studies of divergent thinking. Therefore a test of the effects of timed versus untimed divergent thinking tests

on the relationship between divergent thinking and extraversion appears imperative, with the hypothesis that divergent thinking is positively related to extraversion under conditions of timed testing but not under conditions of untimed testing. It was proposed to conduct the study on a sample of girls of about the same age and from the same school as the previous sample. As in the previous studies the New Junior Maudsley Inventory was used to measure extraversion, and two versions of the Uses Test were used to measure divergent thinking.

Description of the Sample

The subjects comprised 68 first and second year students from Ogilvie High School, a Hobart High School. The girls had an average age of 12 years 11 months with a range from 12 years to 14 years 5 months, and were in the average range of intelligence (90-109). As in the first study selection of the sample was arranged by the School Guidance Officer.

Instruments

Three tests were used:

1. Two versions of the Uses Test, and
2. The New Junior Maudsley Inventory (Furneaux and Gibson, 1966).

Each version of the Uses Test had the same headings, and one version (Uses Test A) involved the same objects as were used in the test for the first and second studies. The other version of the Uses Test (Uses Test B) was identical in format to Uses Test A and involved the following objects: Pencil, Newspaper, Cork and Shoe. The layout of both tests was different to that used in the first and second studies in that two pages for each test were used since this made more space for responses to each item on the tests (samples of the test forms are shown in Appendix C). The specific instructions for the tests were identical to those used in the first and second studies, with the exception that Uses Test A had an imposed time limit of two minutes for each item, that is eight minutes for the whole test. The scores were derived by the method used in the initial testing.

The New Junior Maudsley Inventory was administered according to the standard instructions as set out in the manual.

Procedure

Following selection of the sample all students were administered the New Junior Maudsley Inventory and results from this test were used to divide the sample into two equal groups matched for age and extraversion.

A week following the administration of the personality inventory one group (Group I) was administered Uses Test A under timed conditions and the other group (Group II) was administered Uses Test B under untimed conditions. A week following this testing, Group I was tested on Uses Test B under untimed conditions and Group II was tested on Uses Test A under timed conditions.

This procedure made it possible to assess any effects of the order of test administration and to correlate extraversion with divergent thinking for the same sample under both timed and untimed conditions.

The testing for the experiment was conducted in the cookery room which was considered a room with pleasant associations for most students. As in the earlier studies some effort was made to create a relaxed atmosphere in all testings.

Results

As in Studies I and II each subject had scores for extraversion (E), neuroticism (N), and L scale (L). However in this study each subject had two scores for originality and two for fluency: originality untimed (OU), originality timed (OT), fluency untimed (FU), and fluency timed (FT). Mean and standard deviation scores on all seven scales were

calculated for Groups I, II, and Groups I and II combined, and are shown in Table 9.

TABLE 9

Means and Standard Deviations for each of the Scales shown separately for Group I (timed test administered first) and Group II (untimed test administered first), and Groups I and II combined.

	Group I (N = 34)		Group II (N = 34)		Groups I & II combined (N = 68)	
	M	S. D.	M	S. D.	M	S. D.
Extraversion (E)	10.94	3.01	11.15	2.86	11.04	2.92
Neuroticism (N)	8.79	3.40	7.76	2.37	8.28	2.96
L Scale (L)	8.38	4.47	9.35	3.41	8.87	3.97
Fluency Timed (FT)	18.18	5.18	19.97	6.91	19.07	6.13
Originality Timed (OT)	3.29	3.59	3.65	4.31	3.47	3.94
Fluency Untimed (FU)	20.35	6.12	19.65	6.13	20.00	6.09
Originality Untimed (OU)	3.62	3.38	3.26	3.00	3.44	3.18

It is apparent from Table 9 that for originality and fluency the difference in both timed and untimed test means between Groups I and II are relatively small, and are not

significant as indicated by *t* tests. Thus it appears unlikely that the results were unduly influenced by practice effects, and it was therefore decided to examine the divergent thinking - personality variable relationship for Groups I and II combined as well as separately.

Tables 10, 11 and 12 present correlation matrices for the personality variables and the untimed divergent thinking variables for Group I, Group II, and the combined groups respectively.

TABLE 10

Product Moment Correlation Matrix between the Personality Variables and the Untimed Divergent Thinking Variables for Group I (N = 34).

	E	N	L	FU	OU
Extraversion (E)	1.00				
Neuroticism (N)	-0.11	1.00			
L Scale (L)	-0.01	-0.27	1.00		
Fluency Untimed (FU)	0.20	-0.24	0.10	1.00	
Originality Untimed (OU)	0.23	0.04	0.02	0.59*	1.00

* $p < 0.001$

TABLE 11

Product Moment Correlation Matrix for the
Personality Variables and the Untimed Divergent
Thinking Variables for Group II (N = 34).

	E	N	T	FU	OU
Extraversion (E)	1.00				
Neuroticism (N)	-0.28	1.00			
T Scale	-0.05	-0.17	1.00		
Fluency Untimed (FU)	0.02	-0.03	0.03	1.00	
Originality Untimed (OU)	0.07	0.00	-0.17	0.65*	1.00

* p < 0.001

TABLE 12

Product Moment Correlation Matrix for the Personality
Variables and the Untimed Divergent Thinking
Variables for Groups I and II Combined (N = 68).

	E	N	T	FU	OU
Extraversion (E)	1.00				
Neuroticism (N)	-0.18	1.00			
T Scale	-0.02	-0.25*	1.00		
Fluency Untimed (FU)	0.11	-0.12	0.06	1.00	
Originality Untimed (OU)	0.15	0.03	-0.06	0.62**	1.00

* p < 0.05
** p < 0.001

It is clear that for the groups both separately and combined there are no significant relationships between the divergent thinking variables and the personality variables. This result suggests that divergent thinking is not related to extraversion under untimed conditions, and is consistent with the failure to demonstrate divergent thinking - extraversion relationships in Studies I and II. It should be noted that the divergent thinking variables intercorrelate significantly for Group I, Group II and the combined groups.

Correlation matrices for the personality variables and the timed divergent thinking variables for Group I, Group II and the combined groups are presented in Tables 13, 14 and 15 respectively.

TABLE 13
Product Moment Correlation Matrix for the Personality Variables and the Timed Divergent Thinking Variables for Group I (N = 34).

	E	N	L	FT	OT
Extraversion (E)	1.00				
Neuroticism (N)	-0.11	1.00			
L Scale (L)	-0.01	-0.27	1.00		
Fluency Timed (FT)	0.23	0.02	-0.14	1.00	
Originality Timed (OT)	0.09	0.09	-0.25	0.80*	1.00

* $p < 0.001$

TABLE 14

Product Moment Correlation Matrix for the
Personality Variables and the Timed Divergent
Thinking Variables for Group II (N = 34).

	E	N	L	FT	OT
Extraversion (E)	1.00				
Neuroticism (N)	-0.28	1.00			
L Scale (L)	-0.05	-0.17	1.00		
Fluency Timed(FT)	-0.06	-0.00	-0.01	1.00	
Originality Timed (OT)	0.17	0.17	-0.03	0.36*	1.00

* $p < 0.05$

TABLE 15

Product Moment Correlation Matrix for the Personality
Variables and the Timed Divergent Thinking Variables
for Groups I and II combined (N = 68).

	E	N	L	FT	OT
Extraversion (E)	1.00				
Neuroticism (N)	-0.18	1.00			
L Scale (L)	-0.02	-0.25*	1.00		
Fluency Timed(FT)	0.07	-0.02	-0.05	1.00	
Originality Timed (OT)	0.13	0.11	-0.13	0.53**	1.00

* $p < 0.05$

** $p < 0.001$

It is clear that in each matrix there are no significant relationships between the divergent thinking measures and the personality variables. Therefore the result does not support the hypothesis that divergent thinking and extraversion are related when divergent thinking is tested under timed conditions. Again it should be noted that the divergent thinking variables intercorrelate significantly for each of Group I, Group II and Groups I and II combined.

Discussion

The critical result of this study is the failure to demonstrate a divergent thinking - extraversion relationship under each of the timed and untimed conditions. The failure to obtain significant correlations between the personality variables and the divergent thinking variables is consistent with the results obtained on the sample of boys in the first study and with findings obtained in the second study. It is also consistent with the results obtained by Hudson (1968), Innes (1972) and Rim (1954).

While none of the three studies have demonstrated a relationship between divergent thinking variables and the personality dimensions extraversion and neuroticism, it is difficult to evaluate their significance without a detailed consideration of the methodology involved. Chapter VII discusses the three studies as a whole with particular

emphasis on an analysis of methodological and conceptual issues relating to research in divergent thinking.

CHAPTER VII

GENERAL DISCUSSION

CHAPTER VII

GENERAL DISCUSSION

The findings of Study III are consistent with those of Studies I and II in their failure to demonstrate relationships between divergent thinking and the personality variables extraversion and neuroticism. Study II provides valuable test-retest reliability data for all measures, while Study III investigates the divergent thinking - personality dimension relationship under conditions of both timed and untimed divergent thinking testing.

The absence of significant relationships between the divergent thinking measures and the extraversion scale suggests that divergent thinking and extraversion are not strongly related in adolescent subjects. However the failure to detect such a relationship may have resulted from methodological difficulties in the study. It is also possible that divergent thinking and extraversion are related but not in a linear manner, in which case the correlational analysis would fail to detect this effect.

Methodological difficulties associated with the measures will be discussed first, as the magnitude of the test-retest reliability estimates is of great importance for research in this area. Other relevant methodological and

The Tests

conceptual problems will be discussed later.

Divergent thinking tests: Reliability.

In terms of previous work on the reliability of sample of Study II is difficult to evaluate. The reliability coefficients are not high, that for fluency being 0.41 ($p < 0.05$), and that for originality 0.30. Previous studies using similar tests report test-retest correlation coefficients ranging from 0.03 through to 0.50 or higher (Torrance, 1966). The difference between the reliability figures for fluency and originality is consistent with previous findings that fluency is the more stable variable (Dewing, 1970; Batty, 1971; Torrance, 1966). There are a number of problems associated with these studies which makes comparisons with Study II difficult. First, it appears that only the scoring procedures as those in this study. Secondly, many of the studies did not use the same form or forms for the retest and employed a parallel form instead. A further problem is that there have been few studies of test-retest reliability with student samples over an extended period. Two exceptions are the studies by Kogan and

Pankove (1972) and Cropley and Clapson (1971). Kogan and Pankove (1972) undertook a five-year test-retest reliability study. Their sample was tested when the children were ten years old and fifteen years old, and on both occasions the same test forms were used. Half of the sample received group administered instructions and half received individually administered instructions. Boys in the sample receiving group instructions showed test-retest correlations of 0.38 for fluency, and 0.52 for imagery. For boys receiving individual instructions the correlations were -0.10 for fluency, and 0.39 for imagery. Thus for both groups of boys the measure of imagery showed long term stability. However there was little evidence for long term stability for the girls. The coefficients of individually administered tests were 0.13 for fluency and 0.35 for imagery, while those of group administered tests were 0.07 for fluency and 0.19 for imagery.

The Cropley and Clapson study compared the divergent thinking scores of 12.5 year old children with those on the same tests five years later. On both occasions two tests (the Circles and Consequences tests) were administered in a group situation, and scored for originality only. The reliability coefficients for each test were calculated for boys and girls separately. They ranged from 0.33 for girls to 0.58 for boys on the Consequences test. For the Circles test the reliability coefficients were 0.48 for boys and 0.40 for girls.

The Cropley and Clapson study shows figures for girls comparable with those of Study II. However, comparison between the three studies is difficult because they used different tests to measure divergent thinking. One exception was the Uses test which was common to the Kogan and Pankove study and the present studies but in that case the scoring procedures were different. Nevertheless, the reliability figures obtained in Study II are not as high as might be expected, considering that there is a much greater time lapse between testings in the Kogan and Pankove (1972) and Cropley and Clapson (1971) studies. Explanations of the mediocre test-retest reliability figures could lie in changes the students were undergoing in the school situation between testings and/or the biological changes of early adolescence.

Another fact which could have affected the test-retest reliability data is that even quite small changes in motivation and interest can produce large changes in results (Hudson, 1968; Torrance, 1966). In a review of the divergent thinking literature Vernon (1971) reports that there is evidence that divergent thinking is affected by conditions of testing, the wording of instructions, and the subject's understanding of what is required. In Studies I and II identical instructions were used in both testings but variation in demand characteristics might have occurred. The possible effects of demand characteristics on the testing situation will be discussed later.

Divergent thinking tests: Issues associated with scoring.

The scoring of the divergent thinking tests is both complex and tedious, and there is little reference to this in the literature (Vernon, 1971). In general fluency does not represent serious scoring problems as it is simply a count of the number of different responses produced by each subject for each item, but the scoring procedures for originality are more complex. Two scoring procedures have been used to measure originality. The first method uses ratings of originality of responses. For example, Torrance and his colleagues used preset samples of original responses and ordinary responses as criteria to ascertain originality (Torrance, 1966). In this method the use of more than one rater seems mandatory to check on the reliability of judgements.

A second scoring procedure for originality involves the comparison of each individual response with the total population of responses produced by the sample of subjects. An original response is defined by its relative frequency in the population from which it arose. As this is a statistical procedure there should be no need to check the reliability of the scoring by using different raters. In the present studies this assumption was made and raters were not used. One problem in the statistical scoring procedure

arises where a response involves the elaboration of a response which has already occurred in some general form (Hudson, 1966; Kuusinen, 1970; Vernon, 1971). For example in the Uses test many children may say they would use a brick to build buildings. However one child may think of a particular form of building which is itself unusual or is in an unusual setting. In this case subjective judgement is required. As Vernon (1971) notes, it is difficult to avoid "some subjective evaluations of value, cleverness or originality" (p. 252).

A definitional problem with the statistical method arises when a response would be classified as impractical or ridiculous, perhaps even in the eyes of the originator (Vernon, 1971). Researchers differ on whether they require that original responses be practical (Manske and Davis, 1968). In these studies even impractical and ridiculous responses were accepted as valid, since the instructions of the tests made no mention about the practicality of the use suggested. Notwithstanding the difficulties discussed above the statistical scoring procedure is less subjective and thus inherently more reliable than the method using raters.

The use of both male and female subjects in Study I produces one further difficulty with the statistical scoring method. In Study I the entire sample of boys and girls was used as a means of assessing whether or not a response scored points for originality. As the overall number of

subjects was small this procedure had the advantage of giving the largest possible pool of responses against which originality was assessed. The problem associated with this form of comparison is the associated assumption that boys and girls respond similarly to each item. This assumption cannot be rejected on the basis of perusal of the response pool of both boys and girls. Nevertheless it should be tested in further research. Clearly it is possible that boys and girls may have different perspectives on each of the items, and may respond differently to them. A similar methodological problem exists for the technique which uses raters. Where raters and ratees come from different cultural backgrounds the difference in background could produce differences in their judgements of originality of responses. Therefore differences in cultural background might be a source of inter-rater variation in marking test responses. Many of the problems associated with the scoring procedures might be overcome if the suggestions of Hargreaves and Bolton (1972) are followed. These authors suggest that in practical terms the time and effort required to calculate any scores other than fluency scores on divergent thinking tests do not justify the small amount of extra information gained. This suggestion is consistent with previous findings that fluency correlates highly with other divergent thinking variables (Clark and Mills, 1970). Hargreaves and Bolton have also pointed out that the use of the fluency score

alone could enable automated scoring of divergent thinking tests.

The personality test.

The test-retest reliability coefficients found in Study II over the 14-month period for the extraversion and L scales were 0.31 and 0.36 respectively. These figures are lower than that required for research attempts to relate performance measures to personality characteristics. In addition the reliability of the extraversion scale is substantially lower than that reported by Furneaux and Gibson (1966) in the test manual. Furneaux and Gibson's extraversion scale reliabilities range from 0.88 for a test-retest period of one week to 0.74 for an intervening period of one year. Furneaux and Gibson used sample sizes ranging from 117 to 159 subjects, but information is not provided about the composition of the samples (e.g. sex, age, socio-economic status, etc). In addition Furneaux and Gibson did not report a reliability figure for the L scale.

The neuroticism scale in Study II gave a test-retest reliability correlation of 0.63. This result is quite satisfactory for research purposes and compares favourably with that of most personality scales, particularly as the intervening period is 14 months. The only test-retest reliability coefficient available in the manual for the neuroticism scale is 0.84 over a period of one week.

It is difficult to understand why two variables on the NJMI in Study II showed a low test-retest reliability while one was relatively high. One possible explanation for this discrepancy is that two of the scales (extraversion and L scale) are less appropriate for the Australian population than the third (neuroticism). This proposition is difficult to evaluate in the absence of further research.

A second general explanation for the discrepancy in reliability may be that two of the variables (extraversion and tendency to dissimulate) are not as time stable as the third (neuroticism), and were more open in this case to change according to the following factors:

- (1) Changes the students were undergoing in the school situation,
- (2) Particular demand-characteristics of the testing situation,
- (3) Biological changes of early adolescence, and
- (4) An interaction of the environmental and biological factors.

With regard to the first point, the role of the students at school would have undergone continuous change over the 14-month period. In particular at the time of the first testing (Study I) the children were in the first year of high school. They were low in the student hierarchy, relatively unsophisticated about the school situation and possibly more conforming than they were fourteen months later (Study II) when their aims and expectations in the school

situation could well have been different. The forces and expectations placed on them by the school, their colleagues and themselves may also have been different. For example, the teachers may have perceived the first year high school students in quite a different light to the second year students, perhaps seeing the first year students as rather quieter and more conforming. In turn the students may have regarded the teachers more as authority figures during their first year. Further, their relationship with the school guidance officer, who arranged both testing sessions, would have altered during the 14-month period. In particular it may be that as second year students the sample was more flippant about the guidance officer and somewhat derogatory about students seeking her assistance.

With regard to the question of demand characteristics, the two testing sessions with the female sample in Studies I and II differed in a number of ways. Approximately 50% of the students remembered the researcher from the first testing and this familiarity may have altered the test situation for them. The hypotheses of the study had also changed following the first testing, and while effort was made to create a similar situation with identical instructions, expectancy effects may have occurred (Rosenthal, 1966). In addition the students may have grasped the instructions more readily on the second testing as a result of the previous exposure to the instructions, increased assurance in the school situation, greater flexibility of vocabulary and perhaps a

closer agreement between word meanings held by the children and tester. Further speculation regarding environmental events might include the effects of climate, weather, changes in time tables, and mood prior to the test situation.

The third possible error source relates to the biological changes of early adolescence, a time when personality development and change are relatively rapid (Kennedy, 1971). The sample would have been reaching menarche at different times, with consequent individual differences in social and emotional behaviour.

Finally it is possible that the environmental and biological factors considered above interacted in a complex manner to result in low test-retest reliability for extraversion and the L scale. Thus considerable speculation is possible regarding the discrepancy in test-retest reliabilities, and further research may clarify this issue.

Further Methodological and Conceptual Implications

In this section it is planned to consider both methodological and conceptual implications of the results with particular reference to the hypothesis of a positive relationship between divergent thinking and extraversion. Assuming that the NJMI is an acceptably reliable and valid test of extraversion the data of all three studies indicates that there is no relationship between divergent thinking and extraversion for adolescent school children. However it

is possible that relationships in this study were obscured by the existence of a complex non-linear relationship. Complex curvilinear relationships between divergent thinking and extraversion have previously been reported by Di Scipio (1971), Soueif and El-Sayed (1970) and White (1968). In addition other personality variables have been shown to have non-linear relationships with divergent thinking variables. Kuusinen (1970) reports a curvilinear relationship between complexity and originality, and Long and Henderson (1965) report a J curve relationship between divergent thinking and dogmatism. Unfortunately the samples used in the present studies were too small to consider such relationships. In general, fairly large numbers are needed for the study of complex relationships in the area of divergent thinking as the variance for divergent thinking variables is usually large (Hudson, 1966). Nevertheless the search for complex relationships between divergent thinking and personality variables could be fruitful. In particular the work of Di Scipio (1971) and White (1968) should be replicated and extended.

As noted in Chapter VI some uncertainty exists regarding the possible influence of timing of divergent thinking testing on any divergent thinking - extraversion relationship. This problem was considered in Study III which investigated the relationships between divergent thinking and the NJMI personality variables under both timed and

untimed conditions. Assuming that the measure of extraversion is valid the results of the present studies clearly differ from the report of a significant positive divergent thinking - extraversion relationship in adolescents by Anderson and Cropley (1966). However the different findings may have resulted from differences in measurement techniques between the studies. A major problem of working within the area of divergent thinking is selecting instruments which measure the same variables as those measured in other studies. Assessment of the same variable in different studies is dependent upon the existence of an unambiguous definition of the construct and the use of the same or equivalent instruments. The studies reviewed in Chapter III relating divergent thinking to extraversion used a variety of extraversion measures. Table 16 shows the extraversion measures used in each of the studies.

TABLE 16

Extraversion Measures Employed in Studies Relating
Divergent Thinking to Extraversion.

<u>Study</u>	<u>Measure</u>
Anderson and Cropley (1966)	Myers-Briggs Type Indicator
Di Scipio (1971)	Eysenck Personality Inventory
Iwata (1968)	Bernreuter Personality Inventory
Innes (1972)	Eysenck Personality Inventory
Ohnmacht (1970)	Myers-Briggs Type Indicator
Ryle (in Hudson, 1968)	Hysteroid-Obsessoid Questionnaire
Souelif and El-Sayed (1970)	Eysenck Personality Inventory Bernreuter Introversion Scale and Guilford's R scale in an abbreviated form
Taft (1967)	Maudsley Personality Inventory
Taft (1971)	Maudsley Personality Inventory
White (1968)	16 Personality Factor Test

It should be noted that the Eysenck Personality Inventory and the Maudsley Personality Inventory are parallel instruments, the Hysteroid-Obsessoid Questionnaire correlates highly with the Eysenck type tests (Caine and Hope, 1967, p. 7 - 10), and the Myers-Briggs Type Indicator appears to be measuring characteristics closely in line with those measured by the Eysenck designed tests (Mendelsohn, 1965). Thus there is

some support for the assumption that each of the extraversion tests listed measures the same dimension. However it is apparent that there is a possibility of error in the measurement of extraversion across different instruments and samples.

The same problem of measurement error exists for the definition and assessment of divergent thinking across different studies. In the studies referred to previously there are considerable differences in both the tests employed and the scoring procedures. For example Di Scipio (1972) used the Speed of Cognitive Output Test to assess both originality and fluency. Taft (1967) used the Friends Test and the Observations Test to measure fluency, while White (1968) used the Consequences Test and the Alternate Uses Test to measure fluency, flexibility and originality. It has been shown that the inter-test correlation coefficients for divergent thinking tests are low, particularly under classroom-like situations (Wallach and Kogan, 1965). Thus there exists the possibility of considerable measurement error in research on divergent thinking and personality across investigations using different tests.

An important methodological problem results from the use of a questionnaire to measure extraversion (Eisenman, 1970). While divergent thinking is assessed by a performance task, in personality questionnaires the questions are answered from a person's assessment of his own behaviour, his expectations and the situational environmental

influences on him (Risenman, 1970). The answers to the questions are then abstracted to form a trait score. The trait score abstraction is finally related to the performance measure. Each of the steps involved in using a personality questionnaire decreases the relationship between the performance measure and the subject's answers to questions in the test.

Difficulties associated with the questionnaire-trait approach have been outlined by Mischel (1968, 1973). The basic assumption underlying the trait approach is that a person behaves consistently across different situations. The present study assumed that the personality dimension extraversion is stable across different situations. This assumption is difficult to maintain for personality trait characteristics, with the possible exception of intelligence (Mischel, 1968). Thus the study is open to criticism because of the potentially high levels of error associated with the use of personality questionnaires. An increasingly vocal and articulate group of researchers have argued that the behaviour from which personality characteristics are inferred is determined by the person, the situation, and the interaction between both person and situation variables (Mischel, 1968, 1973; Peterson, 1968; Wallace, 1967). The behaviour from which stable personality characteristics are inferred is related to the stability of the environment (Mischel, 1968). That is, much of the behaviour from which

personality is inferred is subject to change, and varies according to each individual situation. Hence it could be argued that the questionnaire-trait approach is of limited value in research on divergent thinking since the personality variables account for only small amounts of the variance of behaviour across situations (Mischel, 1968).

Working from a personality-trait framework Di Scipio (1971) and White (1968) have demonstrated interesting divergent thinking - extraversion interaction effects with other personality variables. However there are three major points of concern associated with attempts to relate divergent thinking to personality variables. First, it appears unlikely that assessment procedures for the measurement of divergent thinking and personality traits can be sufficiently standardised to enable the results of different studies to be realistically compared. Secondly, the reported relationships between personality traits and divergent thinking have shown no promise of accounting for meaningful amounts of the variance involved in the production of divergent responses. Thirdly, many studies, including the present study, do not take into account the fact that divergent thinking occurs in a social and environmental context.

Consideration of these three points suggests that it may be profitable to examine alternative approaches which offer further research opportunities in the study of divergent thinking. Several research approaches are discussed in the next section.

Implications for Further Research

The research strategies discussed in this section are derived from a conceptual approach which is different from the trait model. This issue has been considered in detail by Mischel (1968, 1973) and is illustrated in the following statement:

The traditional trait-state conceptualization of personality, while often paying lip service to man's complexity and to the uniqueness of each person, in fact lead to a grossly oversimplified view that misses both the richness and the uniqueness of individual lives. A more adequate conceptualization must take full account of man's extraordinary adaptiveness and capacities for discrimination, awareness and self regulation; it must also recognize that men can and do reconceptualize themselves and change and that an understanding of how humans can constructively modify their behaviour in systematic ways is the core of a truly dynamic personality psychology (p. 301).

Following Mischel a number of basic interrelated propositions may be suggested. These proposals are seen as areas for further research in divergent thinking.

(1) In so far as intelligence is excluded, divergent thinking is to a large extent situationally determined.

(2) Individuals show situational differences in divergent thinking according to their past history and development. Thus there is a place for consideration of the individual case study in the area of divergent thinking.

(3) Divergent thinking might be conceptualized as a skill which can be learned and reproduced under specific circumstances.

The first point regarding the situational determinants of divergent thinking follows directly from Mischel's (1968) general overview of research on personality and is consistent with the view of Dutton (1972) about research on interpersonal attraction:

Problems of generalizability have long plagued interpersonal attraction research. There has yet to be discovered in this area a non-platitudinous finding that does not require qualification by a number of situational variables (p. 371).

The assumption of a large situational component of divergent thinking might be challenged by a number of investigators who have shown evidence of a dimension of individual differences in divergent thinking abilities (Wallach and Kogan, 1965; Wallach, 1971; Ward, Kogan and Pankove, 1972). One possible solution to this problem is the study of situational variables in divergent thinking to assess the relative proportions of variance attributable to the person, the situation, and the interaction between the two. Similar research has been conducted on the personality variables anxiety and hostility (Endler and Hunt, 1968). Such research might also establish the types of divergent thinking that are more dependent on the situation, and the types of situation which are generally conducive to divergent thinking. It could also help the evaluation of evidence that personality traits in the traditional trait-state approach usually account for less than 20% of the variance involved (Mischel, 1968).

It can be argued that individuals are more convergent

or divergent in thinking according to the situation they find themselves in, the role they assume, and the sort of behaviour expected of them. Vernon's (1971) review of the literature details evidence showing the importance of the testing situation in producing differences in divergent thinking. There is supporting evidence for the importance of role from the work of Hudson (1968) and Levy (1968). Hudson (1968) found that school boys could modify their divergent responses according to the role they were asked to assume. He concluded from his study that divergent thinking is not a fixed feature of individual mental life, and that it can be modified quite markedly by small changes in social context. Hudson also suggested that the habitual degree of divergent thinking shown by an individual is controlled by his sense of self. It may be that a person would be more consistent as a divergent thinker if he was in a profession with high expectancies of divergent thinking than in one with no such expectancies.

In a rather more complex experiment Levy (1968) sought to establish if originality was a function of role definition, reinforcement for unusual responses, or a combination of these. Levy found that both requesting subjects to adopt a given role and reinforcing original responses increased the degree of originality of responses produced. Levy's work suggests that an individual's behaviour will be judged original or unusual if that

person's role definition or sense of self includes behaving in an original or unusual fashion. Further speculation suggests that one's role definition will change from situation to situation, and that situation and role definition will interact in determining level of originality.

Modelling is another process which may interact with situational and role variables to influence divergent thinking. It has been shown that divergent thinking is facilitated by prompting and modelling (Ayllon and Snyder, 1969; Harris and Evans, 1973; Zimmerman and Dialessi, 1973) and social reinforcement (Goetz and Baer, 1973). For example where a model consistently produces low levels of divergent response a subject also tends to produce few divergent responses; where the model exhibits divergent thinking to a high degree the subject also tends to produce many divergent responses (Ayllon and Snyder, 1969).

It is apparent that the effects on divergent thinking of situational variables, role definition, modelling and reinforcement variables are potentially very complex. Some measure of the subtlety of the divergent thinking phenomenon is illustrated in a study by Renner (1970) who trained subjects to appreciate more complex art stimuli. Following the change in their preference for the more complex stimuli the subjects were able to produce more original responses to a test of divergent thinking. To the degree that divergent thinking is determined by such variables as situation, role definition, modelling and reinforcement variables, it may be

conceptualized as a personal and social skill. With this viewpoint in mind study could be made of the manner in which divergent thinking is learned, and how subjects discriminate appropriate and inappropriate conditions for the production of divergent responses.

The need for detailed study of the process of divergent thinking points out the potential usefulness of experimental studies of individual cases. The special advantages of the individual case study are that it can immediately disprove a generalization, suggest hypotheses for research conducted on groups (Dukes, 1965) and facilitate understanding of how and why individuals change their divergent thinking behaviour. When the single subject design is replicated with a sufficient number of cases the relevance of specific variables can be assessed (Hall, 1972). Previous individual case studies in divergent thinking have shown that:

- (1) Prompting and modelling affects divergent responses in young children (Ayllon and Snyder, 1969),
- (2) Social reinforcement increases diverse block building activities in pre-school children (Goetz and Baer, 1973) and
- (3) Reinforcement procedures appear to produce completely novel behaviour in porpoises (Prior, Haag and O'Reilly, 1969).

A further indication for the use of individual case studies is provided by the fact that the distribution of scores on

some divergent thinking tests tends to have a strong negative skew (Hudson, 1966). Intensive case studies could be made on individuals who contribute largely to the skew effect.

It is clear that experimental case studies would constitute a valuable addition to the research methods currently applied in the study of divergent thinking. Such case studies would be complimentary to the more traditional experimental, correlational and factor analytic studies in the area.

CHAPTER VIII

CONCLUSIONS

CHAPTER VIII

CONCLUSIONS

Studies I, II, and III failed to demonstrate significant linear relationships between the divergent thinking variables originality and fluency, and personality variables extraversion and neuroticism in three samples of adolescents under untimed conditions of divergent thinking testing. In the sample of girls in Study I there was a significant negative correlation between divergent thinking and tendency to dissimulate (L scale). This relationship was not evident when the same sample was retested 14 months later (Study II). Study II demonstrated that test-retest correlations for the sample of girls over a 14-month period were moderate for the two divergent thinking variables, low for the extraversion and L scales, and moderately high for the neuroticism scale. Study III failed to demonstrate a relationship between divergent thinking and extraversion under timed as well as untimed conditions of divergent thinking testing.

The results of the studies are difficult to interpret. Several possible explanations for the low test-retest reliabilities and the failure to demonstrate a divergent thinking - extraversion relationship were discussed. These included consideration of the following factors:

- (1) The nature and applicability of the measures,
- (2) Demand characteristics of the testing situations,
- (3) Changes the students were undergoing at school,
- (4) Biological changes of early adolescents, and
- (5) Interaction of biological and environmental factors.

Following discussion of the results of the present studies and other research in the area of divergent thinking it was suggested that the traditional trait theory approach may be of limited value in further research. Further it was suggested that the experimental correlational and factor analytic approaches be complimented by intensive experimental studies of the individual case.

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APPENDIX A

The Uses Test

USES FOR THINGS

1 _____
11 _____

Name: Age: yrs mths.

Listed below are four objects. Your task is to write down as many different uses as you can for each object.

There are no right or wrong answers, so try to think of as many different and unusual uses as you can. Write down anything that comes to mind, no matter how strange it may seem. Listen while I give you an example:-

1. Write down all the different ways you could use a brick.

.....
.....
.....
.....

2. Write down all the different ways you could use a knife.

.....
.....
.....
.....

3. Write down all the different ways you could use a blanket.

.....
.....
.....
.....

4. Write down all the different ways you could use a chair.

.....
.....
.....
.....

APPENDIX B

Two Completed and Marked
Examples of the Uses Test
taken from the Sample of
Girls

(for clarity of presentation
these examples of the test
forms have been expanded)

USES FOR THINGS

Total Fluency (F)	1	<u>20</u>
Total Originality (O)	11	<u>24</u>

Name: Age: yrs mths.

Listed below are four objects. Your task is to write down as many different uses as you can for each object.

There are no right or wrong answers, so try to think of as many different and unusual uses as you can. Write down anything that comes to mind, no matter how strange it may seem. Listen while I give you an example:-

1. Write down all the different ways you could use a brick.

	F	O
To hit a crook over the head.....	1	0

To practise curate with.....	1	2
------------------------------	---	---

To keep insects in the round holes.....	1	2
---	---	---

To write with.....	1	1
--------------------	---	---

.....

.....

2. Write down all the different ways you could use a knife.

	F	O
To use as a screwdriver.....	1	0

To use as a mirror.....	1	1
-------------------------	---	---

To use as a necklace.....	1	2
---------------------------	---	---

To use as a book mark.....	1	2
----------------------------	---	---

To mix with.....	1	1
------------------	---	---

To lever out a nail.....	1	1
--------------------------	---	---

3. Write down all the different ways you could use a blanket.

	F	O
Putting a fire out.....	1	0
To use in case of emergency for jumping out of.....		
an aeroplane.....	1	2
Use as a net for fishing.....	1	1
To get fruit from a tree.....	1	2
To use as a table cloth.....	1	1

4. Write down all the different ways you could use a chair.

	F	O
To shelter a small animal.....	1	2
To tame a lion.....	1	1
To use as a nail.....	1	2
To use as a bed.....	1	1
To use for firewood.....	1	0
.....		

USES FOR THINGS

Total Fluency (F)	1	<u>13</u>
Total Originality (O)	11	<u>4</u>

Name: Age: yrs mths.

Listed below are four objects. Your task is to write down as many different uses as you can for each object.

There are no right or wrong answers, so try to think of as many different and unusual uses as you can. Write down anything that comes to mind, no matter how strange it may seem. Listen while I give you an example:-

1. Write down all the different ways you could use a brick.

	F	O
For building.....	1	0
If I got real angry at someone I'd throw it to.....		
scare them off.....	1	0
To knock someone out by hitting them over the.....		
head if they were kidnapping anyone.....	1	0
.....		

2. Write down all the different ways you could use a knife.

	F	O
For eating with.....	1	0
To cut string or wood.....	1	0
To stab someone.....	1	0
To peel vegetables.....	1	0
.....		
.....		

3. Write down all the different ways you could use a blanket.

	F	O
To keep warm.....	1	0
To try and smuggle something to another country.....		
in one.....	1	2
To suffocate someone by putting it over their.....		
heads.....	1	2
.....		

4. Write down all the different ways you could use a chair.

	F	O
To sit on.....	1	0
For helping you reach something by standing on.....		
it.....	1	0
If someone was trying to get in, you could put.....		
it against the door.....	1	0
.....		

APPENDIX C

Uses Tests used in
STUDY III

3. Write down all the different ways you could use a **BLANKET**:

4. Write down all the different ways you could use a **CHAIR**:

3. Write down all the different ways you could use a CORK:

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

4. Write down all the different ways you could use a SHOE:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings visible on the paper.